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# THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME;

**Pioneer Hi-Bred International, Inc.**

Whereas, THERE HAS BEEN PRESENTED TO THE

**Secretary of Agriculture**

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF *eighteen* YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT (T. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

CORN

'PHT05'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this 29th day of July in the year of our Lord one thousand nine hundred and ninety-four.

Attest:

*Kenneth A. Evans*

Commissioner

Plant Variety Protection Office

Agricultural Marketing Service

*Mike Eszy*  
Secretary of Agriculture



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U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE  
(Instructions on reverse)

Application for Plant Variety Protection Certificate  
Form Approved OMB 5810-0011 (Rev. 11-91)

1. NAME OF APPLICANT(S) (as it is to appear on the Certificate)		2. TEMPORARY OR SIGNATURE OR EXPERIMENTAL NO.	3. VARIETY NAME
PIONEER HI-BRED INTERNATIONAL, INC.			PHTD5
4. ADDRESS (street and no. or R.F.D. no., city, state and ZIP)		5. PHONE (include area code)	FOR OFFICIAL USE ONLY
Research and Product Development Division P. O. Box 85 Johnston, IA 50131-0085		515/270-3300	PRO NUMBER 9400095
6. GENUS AND SPECIES NAME	7. FAMILY NAME (Botanical)	8. DATE OF DETERMINATION	
Zea Mays	Gramineae	March 20, 1990	
9. CROP KIND NAME (Common Name)	10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION (Corporation, partnership, association, etc.)		
Corn	Corporation		
11. IF INCORPORATED, GIVE STATE OF INCORPORATION		12. DATE OF INCORPORATION	
Iowa		May 6, 1926	
13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS			
Dr. Bruce D. McBratney Research and Product Development Division Pioneer Hi-Bred International, Inc. P.O. Box 85, Johnston, IA 50131-0085			
14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse)			
<input checked="" type="checkbox"/> Exhibit A. Origin and Breeding History of the Variety. <input checked="" type="checkbox"/> Exhibit B. Novelty Statement. <input checked="" type="checkbox"/> Exhibit C. Objective Description of Variety. <input checked="" type="checkbox"/> Exhibit D. Additional Description of Variety. <input checked="" type="checkbox"/> Exhibit E. Statement of the Basis of Applicant's Ownership. <input checked="" type="checkbox"/> Seed Sample (2,500 viable untreated seeds). Date Seed Sample mailed to Plant Variety Protection Office 1-31-94 <input checked="" type="checkbox"/> Filing and Examination Fee (\$2.150) made payable to "Treasurer of the United States."			
15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? (See section 42(a) of the Plant Variety Protection Act.)			
<input type="checkbox"/> YES IF "YES," answer items 16 and 17 below <input checked="" type="checkbox"/> NO IF "YES," skip to item 18 below			
16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATION(S)?		17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED?	
<input type="checkbox"/> YES <input type="checkbox"/> NO		<input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED	
18. DID THE APPLICANT(S) PREVIOUSLY FILE FOR PROTECTION OF THE VARIETY IN THE U.S.?			
<input type="checkbox"/> YES IF "YES," through <input type="checkbox"/> Plant Variety Protection Act <input type="checkbox"/> Patent Act. Give date: _____ <input checked="" type="checkbox"/> NO			
19. HAS THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETED IN THE U.S. OR OTHER COUNTRIES?			
<input type="checkbox"/> YES IF "YES," give names of countries and dates <input checked="" type="checkbox"/> NO			

The applicant(s) declares that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.

The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believes that the variety is distinct, stable, and uniform as required in section 41, and is entitled to protection under the provisions of section 42 of the Plant Variety Protection Act. A person(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF APPLICANT (Owner)	CAPACITY OR TITLE	DATE
PIONEER HI-BRED INTERNATIONAL, INC.		
SIGNATURE OF APPLICANT (Owner)	CAPACITY OR TITLE	DATE
Bruce D. McBratney	Technical Support Coord.	January 31, 1994

## 14A. Exhibit A. Origin and Breeding History

Pedigree: PHH93/PHR25)X742X

Pioneer Line PHTD5, Zea mays L., a yellow corn inbred, was developed by Pioneer Hi-Bred International, Inc. from the single cross PHH93 x PHR25 using the pedigree method of breeding. The progenitors of PHTD5 are proprietary inbred lines of Pioneer Hi-Bred International, Inc. Selfing and selection were practiced within the above F1 cross for 2 generations in the development of PHTD5 at Glyndon, MN. During line development, crosses were made to inbred testers for the purpose of estimating the line's combining ability. Yield trials were grown at Glyndon, MN, as well as other Pioneer research stations. After initial testing, additional hybrid combinations have been evaluated and subsequent generations of the line have been grown and hand-pollinated with observations made for uniformity.

PHTD5 has shown uniformity and stability for all traits as described in Exhibit C - "Objective Description of Variety". It has been self-pollinated and ear-rowed 2 generations with careful attention paid to uniformity of plant type to assure genetic homozygosity and phenotypic stability. The line has been increased both by hand and in isolated fields with continued observations for uniformity.

No variant traits have been observed or are expected in PHTD5.

The criteria used in selection of PHTD5 were yield, both per se and in hybrid combinations; kernel size, especially important in production; ability to germinate in adverse conditions; number of tillers, especially important in production because having numerous tillers increases hybrid production costs spent on detasseling; disease and insect resistance; pollen yield; tassel size; pollen shed duration.

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DEVELOPMENTAL HISTORY FOR PHTD5

<u>SEASON/YEAR</u>	<u>INBREEDING LEVEL</u>
Summer 1984	F0
Summer 1985	F1
Summer 1986	F2
Summer 1987	F3*
Summer 1988	F4
Summer 1989	F5**

\*PHTD5 was selfed and selected through F3 generation.

\*\*PHTD5 was selfed and ear-rowed F3 and F5 generations.

## 14B. Exhibit B. Novelty Statement

PHTD5 is similar to the Pioneer Hi-Bred International, Inc. proprietary inbred line PHR25 (PVP Certificate No. 8800002). PHTD5 has a slight tendency to develop two ears per stalk whereas PHR25 develops only one ear per stalk. PHTD5 has dark green leaves, PHR25 has medium green leaves. PHTD5 has few longitudinal leaf creases whereas they are absent on PHR25. PHTD5 has red anthers compared to PHR25 which has purple anthers. PHTD5 has straight, indistinct kernel rows but PHR25 has straight, distinct kernel rows.

PHTD5 has higher yield, grain harvest moisture and test weight than PHR25. PHTD5 has better seedling vigor and higher early stand count than PHR25. PHTD5 flowers (GDU Shed and GDU Silk) later than PHR25. PHTD5 has better grain appearance than PHR25.

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EXHIBIT NO. C

VARIETY DESCRIPTION INFORMATION

INBRED = PHTD5

Type: Dent

Region Best Adapted: North Central

A. Maturity: Average across maturity zones. Zone : 0

Heat Unit Shed: 1230

Heat Unit Silk: 1250

No. Reps: 23

HEAT UNITS = 
$$\frac{[\text{Max. Temp. } (<_{86}^{\circ}\text{F.}) + \text{Min. Temp } (>_{50}^{\circ}\text{F.})]}{2} - 50$$

\* If maximum is greater than 86 degrees fahrenheit, then 86 is used and if minimum is less than 50, then 50 is used. Heat units accumulated daily and can not be less than 0.

B. Plant Characteristics:

Plant height (to tassel tip): 184 cm

Length of top ear internode: 12 cm

Number of ears per stalk: Slight two ear tendency

Ear height (to base of top ear): 92 cm

Number of tillers: None

Cytoplasm type: Normal

C. Leaf:

Color: (B14) Dark Green

Angle from Stalk: 30-60 degrees

Marginal Waves: (WF9) Few

Number of Leaves (mature plants): 19

Sheath Pubescence: (W22) Light

Longitudinal Creases: (OH56A) Few

Length (Ear node leaf): 67 cm

Width (widest point, ear node leaf): 9 cm

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D. Tassel:

Number lateral branches: 15  
Branch Angle from central spike: 30-40 degrees  
Pollen Shed: Light based on Pollen Yield Test  
(88% of experiment means)  
Peduncle Length (top leaf to basal branches): 12 cm  
Anther Color: Red  
Glume Color: Green

E. Ear (Husked Ear Data Except When Stated Otherwise):

Length: 13 cm  
Weight: 104 gm  
Mid-point Diameter: 41 mm  
Silk Color: Salmon  
Husk Extension (Harvest stage): Medium (barely covering ear)  
Husk Leaf: Short (< 8 cm)  
Taper of Ear: Average  
Position of Shank (dry husks): Upright  
Kernel Rows: Straight Indistinct Number = 16  
Husk Color (fresh): Light Green  
Husk Color (dry): Buff  
Shank Length: 13 cm  
Shank (No. of internodes): 8

F. Kernel (Dried) :

Size (from ear mid-point)  
 Length: 11 mm  
 Width: 8 mm  
 Thick: 5 mm  
 Shape Grade (% rounds): 40-60 (45% medium round based on Parent  
 Test Data)  
 Pericarp Color: Colorless  
 Aleurone Color: Homozygous Yellow  
 Endosperm Color: Yellow  
 Endosperm Type: Normal Starch  
 Gm Wt/100 Seeds (unsized): 28 gm

G. Cob:

Diameter at mid-point: 22 mm  
Strength: Strong  
Color: Red



## H. Diseases:

N. Leaf Blight (E. turcicum): Intermediate  
 Common Rust (P. sorghi): Resistant  
 Stewart's Wilt (E. stewartii): Intermediate  
 Common Smut (U. maydis): Highly Resistant  
 Head Smut (S. reillana): Intermediate  
 Fusarium Ear Mold (F. moniliforme): Highly Resistant  
 Gibberella Ear Rot (G. zeae): Intermediate

## I. Insects:

European Corn Borer-1 Leaf Damage (Pre-flowering): Susceptible  
 European Corn Borer-2 (Post-flowering): Intermediate

The above descriptions are based on a scale of 1-9, 1 being highly susceptible, 9 being highly resistant.

S (Susceptible): Would generally represent a score of 1-3.  
 I (Intermediate): Would generally represent a score of 4-5.  
 R (Resistant): Would generally represent a score of 6-7.  
 H (Highly Resistant): Would generally represent a score of 8-9. Highly resistant does not imply the inbred is immune.

## J. Variety Most Closely Resembling:

Character	Inbred
Maturity	PHR25
Usage	PHR25

PHR25 (PVP Certificate No. 8800002) is a Pioneer Hi-Bred International, Inc. proprietary inbred.

Data for Items B, C, D, E, F, and G is based primarily on a maximum of two reps from Johnston, Iowa grown in 1992, plus description information from the maintaining station.

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CLARIFICATION OF DATA IN EXHIBITS C AND D

Please note the data presented in Exhibit C, "Objective Description of Variety," is data collected primarily at Johnston, Iowa plus description information from the maintaining station. The data in Exhibit D, "Additional Description of Variety," is data from comparisons of inbreds or hybrids grown in the same tests in the adapted growing area of PHTD5.

WAVELT, #1 - H11D3  
VARIETY #2 - FR25

\* = 10% SIG + = 5% SIG # = 1% SIG

YEAR	VAR	BU	ACR	ACR	MST	WT	TST	BAR	SDG	EST	DRP	CUJ	CUJ	GRN	STA	STK	RT	BRT
	#	ABS	%AN	ABS	ABS	ABS	ABS	ABS	ABS	ABS	ABS	SHD	SLK	APP	GRN	LDG	LDG	STK
												ABS	ABS	ABS	ABS	ABS	ABS	ABS
91	1	67.2	110	19.3	58.5	58.5	98.2	5.3	44.1	99.7	1211	1204	6.0	6.5	94.5	95.2	99.4	
	2	58.4	97	18.8	55.9	55.9	95.5	5.2	47.4	99.8	1173	1195	3.7	2.0	97.7	84.9	98.2	
	LOCS	9	9	9	9	9	4	3	18	6	16	13	5	1	6	4	2	
	REPS	20	20	20	20	20	6	4	28	14	22	16	12	2	14	10	4	
	PROB	.032+	.057*	.150	.000#	.224	.840	.043+	.363	.000#	.291	.041+	.189	.187	.146			
92	1	78.5	113	16.5	59.0	59.0	99.0	5.1	36.6		1220	1237	4.0	2.1	96.9	100.0		
	2	79.0	114	16.5	57.5	57.5	99.3	4.7	34.4		1175	1207	4.0	1.8	91.4	100.0		
	LOCS	3	3	3	3	3	6	10	27		27	26	1	4	3	1		
	REPS	18	18	18	18	18	12	20	64		34	30	1	9	13	1		
	PROB	.930	.882	.964	.132	.831	.461	.010+	.000#	.004#	.236	.455						
93	1	41.7	142	16.1	57.6	57.6	95.5	5.6	43.1		1229	1243	2.3	2.3	95.4			
	2	33.5	114	16.6	56.7	56.7	83.7	4.4	38.2		1211	1232	2.8	2.8	93.6			
	LOCS	3	3	3	3	3	6	8	19		17	17	6	3	3			
	REPS	18	18	18	16	16	21	18	65		29	30	14	16				
	PROB	.206	.177	.448	.409	.210	.149	.006#	.198	.423			.103	.034+				
TOTAL SUM	1	64.4	117	18.1	58.4	58.4	97.5	5.3	40.6	99.7	1220	1231	5.7	2.6	95.3	95.2	99.6	
	2	57.5	104	17.9	56.4	56.4	92.5	4.7	39.2	99.8	1185	1212	3.7	2.4	95.1	84.9	98.8	
	LOCS	15	15	15	15	15	16	21	64	6	60	56	6	11	12	4	3	
	REPS	56	56	56	54	54	39	42	157	14	85	76	13	25	43	10	5	
	DIFF	6.8	13	0.2	2.0	5.0	0.6	1.4	0.2	.35	19	2.0	0.3	0.2	10.3	0.8		
	PROB	.015+	.018+	.407	.000#	.147	.097*	.079*	.363	.000#	.003#	.048+	.589	.908	.187	.205		

DEFINITIONS

In the description and examples, a number of terms are used herein. In order to provide a clear and consistent understanding of the specification and claims, including the scope to be given each term, the following definitions are provided:

BAR PLT = BARREN PLANTS. This is the percent of plants per plot that were not barren (lack ears).

BRT STK = BRITTLE STALKS. This is a measure of the stalk breakage near the time of pollination, and is an indication of whether a hybrid or inbred would snap or break near the time of flowering under severe winds. Data are presented as percentage of plants that did not snap.

BU ACR = YIELD (BUSHELS/ACRE). Actual yield of the grain at harvest adjusted to 15.5% moisture. ABS is in absolute terms and MN is percent of the mean for the experiments in which the hybrid or inbred was grown.

DRP EAR = DROPPED EARS. This is a measure of the number of dropped ears per plot and represents the percentage of plants that did not drop ears prior to harvest.

EAR HT = EAR HEIGHT. The ear height is a measure from the ground to the top developed ear node attachment and is measured in centimeters.

EST CNT = EARLY STAND COUNT. This is a measure of the stand establishment in the spring and represents the number of plants that emerge on a per plot basis for the hybrid or inbred.

GDU SHD = GDU TO SHED. The number of growing degree units (GDU) or heat units required for an inbred line or hybrid to have approximately 50 percent of the plants shedding pollen and measured from the time of planting. Growing degree units are calculated by the Barger Method, where the heat units for a 24-hour period are:

$$\text{GDU} = \frac{(\text{Max. temp.} + \text{Min. temp.})}{2} - 50$$

The highest maximum temperature used is 86°F and the lowest minimum temperature used is 50°F. For each inbred or hybrid it takes a certain number of GDUs to reach various stages of plant development.

GDU SLK = GDU TO SILK. The number of growing degree units required for an inbred line or hybrid to have approximately 50 percent of the plants with silk emergence from time of planting. Growing degree units are calculated by the Barger Method as given in GDU SHD definition.

GRN APP. = GRAIN APPEARANCE. This is a 1 to 9 rating for the general quality of the shelled grain as it is harvested based on such factors as the color of the harvested grain, any mold on the grain, and any cracked grain. High scores indicate good grain quality and low scores indicate poor grain quality.

MST = HARVEST MOISTURE. The moisture is the actual percentage moisture of the grain at harvest.

PLT HT = PLANT HEIGHT. This is a measure of the height of the plant from the ground to the tip of the tassel in centimeters.

RT LDG = ROOT LODGING. Root lodging is the percentage of plants that do not root lodge; plants that lean from the vertical axis at an approximately 30° angle or greater would be counted as root lodged.

SDG VGR = SEEDLING VIGOR. This is the visual rating (1 to 9) of the amount of vegetative growth after emergence at the seedling stage (approximately five leaves). A higher score indicates better vigor and a low score indicates poorer vigor.

STA GRN = STAY GREEN. Stay green is the measure of plant health near the time of black layer formation (physiological maturity). A high score indicates better late-season plant health.

STK LDG = STALK LODGING. This is the percentage of plants that did not stalk lodge (stalk breakage) as measured by either natural lodging or pushing the stalks and determining the percentage of plants that break below the ear.

TST WT = TEST WEIGHT UNADJUSTED. The measure of weight of the grain in pounds for a given volume (bushel).

14E. EXHIBIT E. Statement of the Basis of Applicant's Ownership

Pioneer Hi-Bred International, Inc., Des Moines, Iowa, is the employer of the plant breeders involved in the development and evaluation of PHTD5. Pioneer Hi-Bred International, Inc. has the sole rights and ownership of PHTD5.